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ABSTRACT

The purposes of this study were to provide information about how formal features of television are related to children's selective attention and to determine how selective attention is related, in turn, to comprehension of content. Formal features are defined as attributes of television productions that are relatively content-free and that result from visual and auditory production techniques. Specifically, it was hypothesized that features influence comprehension in two ways: (1) salient features may draw attention selectively to certain content--that is, they may serve to emphasize and mark important content, or (2) salient features may provide a developmentally appropriate mode of representation for encoding content in iconic or symbolic codes. Analysis included an investigation of the information processing chain from the effects of salience on attention to later comprehension of content. A total of 128 children at two age levels (kindergarten and and third/fourth graders) viewed a prosocial cartoon in same-sex pairs. Each child's visual attention to the television screen was continuously scored on a Datamyte. Children were then given a recall test consisting of 60 multiple-choice items. These questions had previously been cross-classified according to dimensions of content (either central or incidental) and formal features used to present that content (either salient or nonsalient). Results are discussed. (RH)

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The Effects of Selective Attention to Television Forms on Children's Comprehension of Content

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Abstract

Children's selective attention to television formal features may affect their comprehension of central and incidental content. Two age groups (kindergarten and third-fourth grades) watched a prosocial cartoon (N=128). Visual attention was scored continuously, and recall was measured using multiple-choice questions. Both age groups attended to portions of the program containing perceptually salient features such as rapid action, sound effects, and visual special effects. Younger children attended more than older children to some salient features, whereas older children attended somewhat more to dialog and moderate levels of action. Correlations of attention with comprehension suggested that young children gained information by attending during salient auditory features, while older children benefited from attention during child dialog and moderate character action. Salient auditory variables may have marked central child dialog for the younger viewers whereas older children did not need such aids. Among younger children, inattention during adult narration was a mark of sophisticated viewing and comprehension, while inattention to camera zooms marked an effective viewing pattern for older children. Central content associated with salient formal features was well understood by both age groups, suggesting the use of salient forms to highlight central content in children's television programs. The development of children's selective attention to certain television forms and selective inattention to others may constitute a critical step in the development of television literacy--a step which may be very important in the cognitive development of the "media generation".

In a number of studies carried out by our research group at Kansas (whose acronym is CRITC), we have been exploring the hypothesis that children's processing of television content depends in part on their selective attention to and comprehension of the formal production features of the medium. Formal features are attributes of television productions that are relatively content-free and that result from visual and auditory production techniques. These features vary in perceptual salience, defined in this model as a high level of Berlyne's collative variables: that is, intensity, movement, contrast, change, novelty, and incongruity. Perceptually salient features include character action (literal physical movement), loud music, sound effects, vocalizations, visual special effects, camera zooms, and pans. The major nonsalient feature in television is character speech and narration, which, of course, is often used to convey important plot information. The major purpose of this paper is to describe what features in a television production guide children's selective attention—that is, the perceptual pick-up of information relevant to understanding the central story plot.

The relation of selective attention to comprehension has been the concern of several recent studies. With few exceptions, most previous research has examined influences on attention and has inferred effects on comprehension or has measured comprehension and inferred attentional processes. Two years ago at SRCD, we reported such an analysis of comprehension and suggested some hypotheses about attentional processes that might account for the findings. We found that children's comprehension of a television story plot varies as a function of the formal features used to present different story elements. As seen in Figure 1, central content, presented with perceptually salient formal features such as moderate character action, was better understood than central content presented with nonsalient character dialog, particularly for the younger children. In the paper presented here, we report a finer analysis of children's attention to for-

mal features to test these ideas. Specifically, we hypothesize that features influence comprehension in two ways: 1) Salient features may draw attention selectively to certain content; that is, they may serve to emphasize and mark which content is important, or 2) Salient features may provide a developmentally appropriate mode of representation for encoding content in iconic or symbolic codes.

Perceptually salient formal features like sound effects may draw attention to the story content they are used to present, especially for younger, less experienced viewers. Among older more experienced viewers, the perceptual salience of forms may be less important than their use to determine which content is most attention-worthy for one who seeks to understand the central story plot. Therefore, our model predicts that formal features will affect comprehension via their influence on selective attention as a function of features used in production and children's age.

The next step in information processing is also influenced by form. If a child attends to features that provide a mode in which she can encode and represent content, such as appropriate images or words, then comprehension will be facilitated. Thus, the striking visual and auditory events that characterize much of children's television can provide images for encoding content. Television's visual images lend themselves to the iconic encoding strategies of young children, and their capacity to do so can be independent of the centrality of the information encoded. Older children should benefit as well from selective attention to character speech, a nonsalient feature, because they are more proficient at verbal, symbolic encoding of content.

The present study analysed the information-processing chain from the effects of salience on attention to later comprehension of content. Our purposes were twofold. The first was to provide information about how formal features of tele-

vision are related to children's selective attention. The second was to determine how selective attention relates, in turn, to comprehension of content.

One hundred and twenty-eight children at two age levels, kindergarten and third-fourth graders, viewed a prosocial cartoon—Fat Albert and the Cosby Kids—in same-sex pairs. Each child's visual attention to the TV screen was continuously scored on a Datamyte. Children were then given a recall test of 60 multiple choice items. These questions had been cross-classified on two dimensions: content (central or incidental) and formal features used to present that content (salient or nonsalient).

The first results concern developmental differences in children's visual attention to salient and nonsalient formal features. For each formal feature, the index of selective attention was the proportion of time the child spent looking at the screen during the presence of that feature, minus the proportion of time spent looking when the feature was absent. It is thus an index of net attention maintained by each feature. As you can see in Table 1 in your handout, children of both ages attended to most of the salient formal features. Both ages attended selectively to rapid character action, vocalizations, sound effects, visual special effects, pans, and moderate character action. By contrast, children looked away when camera zooms and music occurred. Character speech, a nonsalient feature, produced variable effects on children's attention. Children looked when child dialog occurred, but not when male adult narration occurred, which is consistent with previous findings by Anderson and his colleagues.

Overall, the most striking aspect of the age comparisons was the similarity rather than the differences in attention patterns. Children of both ages were attentive to vocalizations, sound effects, visual special effects, and pans. Predicted age differences did occur in selective attention to different action levels; that is, young children attended most to rapid character action while

older children attended most to moderate character action,(which is somewhat less salient, but probably more informative than rapid action.) Older children looked away more during camera zooms and music. As predicted, younger children attended less to both child dialog and adult narration than did older children, but these effects were of borderline significance.

Thus far we have described similarity of attention patterns for the two age groups, and among younger children, better comprehension of central content when it is marked for selective attention by highly salient production features. Now let's consider the relationship between attention to different production features and comprehension of content.

For this analysis, each child received a "net attention" score for each formal feature. Recall that this score is the difference between the child's attention when the feature was present and her attention when the feature was absent. These net attention scores were entered for each child as predictors of each of four comprehension scores. These four scores represented all cells in a two by two matrix which classified central and incidental content by the formal features used to present that content (salient or nonsalient).

Table 2 gives the zero order correlations between net attention and comprehension. Overall, children who attended to child dialog and character vocalizations understood almost all content categories better than those who did not. Table 3 reveals that in the multiple regressions, vocalizations and sound effects were the best predictors of young children's comprehension. The vocalizations in this program signaled key events, and thus, served as markers of important content. For example, Fat Albert frequently said "Hey Hey Hey" followed by an important verbal statement. For older children, attention to child dialog and inattention to camera zooms marked an effective comprehension pattern. There was one category—central content presented with nonsalient formal features—which was not associated with attention to any of the formal features. Understanding of

the latter category was also the most difficult for young children.

The analyses of attentional patterns provide information relevant to our hypotheses concerning attention and comprehension. Salient forms could aid comprehension by drawing attention to important content or by providing a representational form that children could readily encode. The findings for younger children suggest that salient forms were most important for drawing the child's attention to central content. Young children gained information primarily from attention to auditory variables; in particular, vocalizations and sound effects called attention to central child dialog thereby aiding the comprehension process. It appears that children could comprehend symbolically presented information when aids to selection were present; the difference between younger and older children reflects the growth of the ability to select content to encode rather than the ability to comprehend or use verbal symbolic information once they attended to it.

Though young children gained information from child dialog, adult narration was neither attention-worthy nor informative. In fact, children who attended to this feature were less likely to understand the story than were those who ignored it. These attention patterns were consistent with Anderson's finding that children attend more during speech about observable events than to speech whose referent is removed in time and place. In the cartoon used in the present study, the adult male narration was presented in a less salient format than the story. That is, the male narrator spoke in abstract language about the central story plot in a live format.

Older children also appear to use salient features as guides to central content, but they have more skill in using features that provide information in symbolic forms to guide their attention and encode information as well. Older children gained information primarily from attention during child dialog, vocalizations, and moderate character action. Attention to a feature such as

moderate character action, which is often used in educational programming, may provide an opportunity for both iconic and symbolic encoding when paired with child dialog. Inattention to camera zooms was also associated with better comprehension patterns for older children. Salomon's work suggests that zooms can supplant certain cognitive operations and may, therefore, be useful to young or immature viewers. For sophisticated viewers, such supplanting is unnecessary and may hinder comprehension. Thus, inattention to camera zooms may indicate well developed television viewing skills and a mature pattern of selective attention.

For both age groups, attentional patterns predicted comprehension of incidental better than central content. Incidental content is easier to understand than central, presumably because it is generally brief, concrete, discrete, and factual; by contrast, central content comprehension requires temporally integrated processing and inferences about implicit story events. Thus, as suggested by Collins, comprehension of central content may be limited by the cognitive capacities of children, and may be correspondingly less influenced by form.

In summary, the findings of the study support the hypothesis that salient formal features marked central content for processing. For young children, salient auditory forms—vocalizations and sound effects—called attention to central child dialog, a symbolic, nonsalient formal feature. Inattention to the adult male narrator, who presented information in a nonsalient format, was a sign of sophisticated viewing which was positively associated with comprehension. Older children not only selected important dialog for attention and processing, but also ignored camera zooms. The development of children's selective attention to television forms may be a critical step in the development of television literacy—a step which may be very important in the cognitive development of the media generation.

Figure 1. Mean Proportion Correct on Comprehension Test as a Function of Feature Salience and Content Centrality.

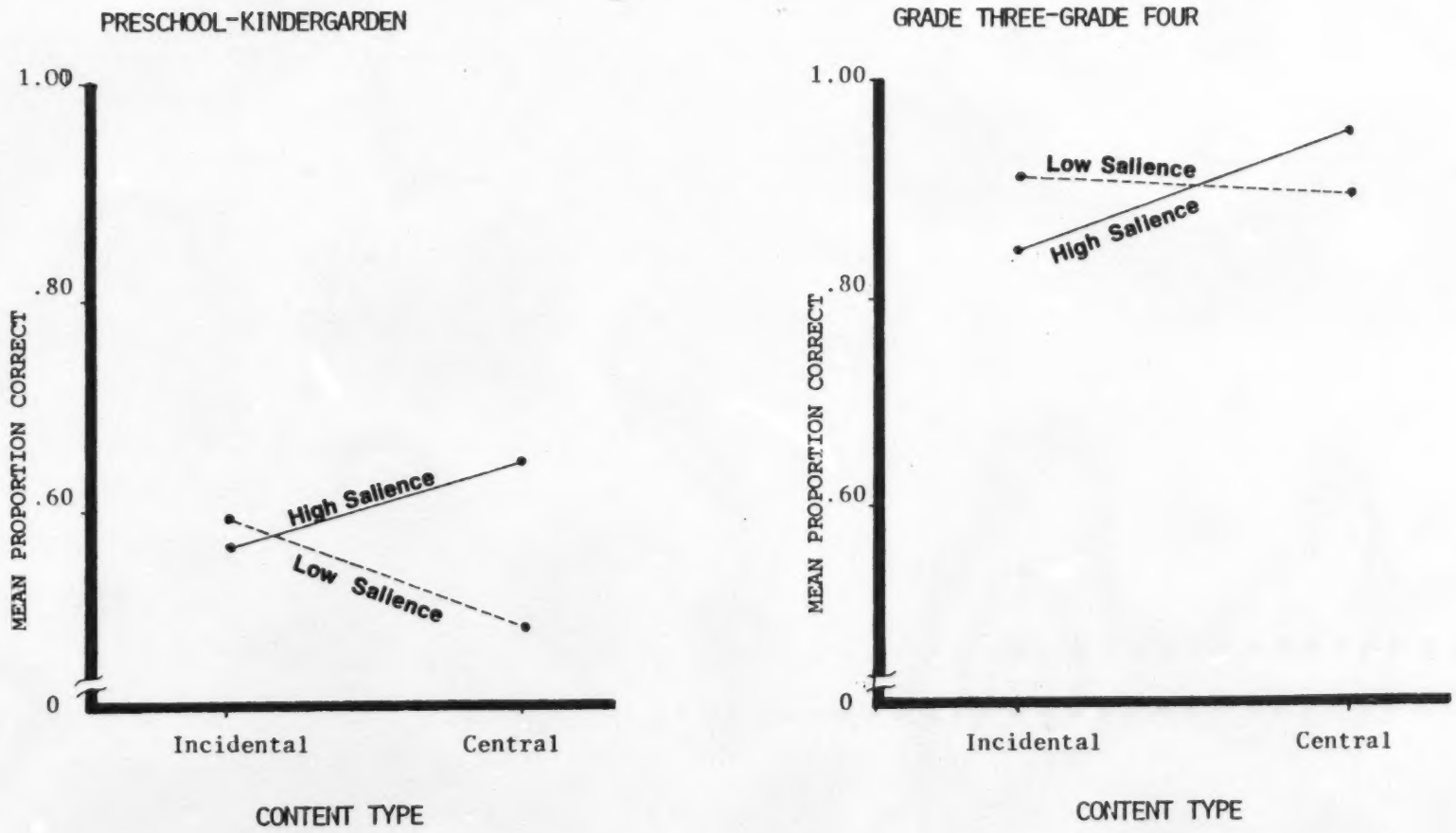

Table 1
Mean Net Attention to Formal Features for Two Age Groups

Formal Features	Both Ages Mean	F for Presence	Younger Mean	Older Mean	F for Age x Presence
Salient Features					
1. Rapid character action	.05	20.50***	.07	.03	3.07*
2. Vocalizations	.08	43.33***	.06	.10	n.s.
3. Sound effects	.03	15.87***	.03	.03	n.s.
4. Visual special effects	.04	16.07***	.06	.03	n.s.
5. Pans	.06	15.89***	.05	.06	n.s.
6. Zooms	-.05	8.64***	.00	-.10	10.76***
7. Music	-.04	6.11**	-.01	-.06	4.86**
8. Moderate character action	.06	12.39***	.01	.11	9.91***
Nonsalient Features					
9. Child dialog	.05	15.06***	.03	.07	2.75*
10. Adult narration	-.09	21.96***	-.12	-.05	3.40*

*p < .10
**p < .05
***p < .01

Note: Net attention means are difference scores computed as proportion attention during feature presence minus proportion attention during feature absence. Positive means indicate more attention during feature presence than absence; negative means indicate the reverse. df = (1,52) for all effects.

Table 2

Zero-Order Correlations of Net Attention Scores with Comprehension Scores for Four Comprehension Categories by Age Group

		Comprehension Category							
		Salient Forms				Nonsalient Forms			
	Net Attention to Formal Features	Central		Incidental		Central		Incidental	
		Young	Old	Young	Old	Young	Old	Young	Old
1.	Rapid character action	-.10	-.12	.14	-.16	.20	.20	.10	-.24*
2.	Vocalizations	.28**	.28**	.51**	.15	.16	.00	.30**	.21*
3.	Sound effects	.07	-.01	.35**	.18	.05	.17	.21*	-.06
4.	Visual special effects	.06	.02	.06	.13	-.10	-.25	.10	.01
5.	Pans	-.22*	.02	-.03	-.24	.07	.07	-.19	-.16
6.	Zooms	-.15	-.37***	-.12	-.25**	-.18	-.07	.05	-.18
7.	Music	-.20	-.23*	-.04	-.01	-.15	.07	-.15	-.18
8.	Moderate character action	-.15	.24*	.18	.21*	-.23	-.14	.06	-.03
9.	Child dialog	.22*	.33**	.36***	.26**	-.16	-.05	.31**	.31**
10.	Adult narration	-.12	.09	-.33**	-.14	-.05	.08	-.38***	.10

*$p < .10$

**$p < .05$

***$p < .01$

Table 3

Multiple Regression Analyses of Comprehension by Age Groups and Comprehension Category, with Net Attention Scores as Predictors

Content Type	Comprehension Category: Salient Forms			Comprehension Category: Nonsalient Forms		
	Predictor	Multiple R	R^2	Predictor	Multiple R	R^2
Central						
Younger	1. Vocalizations	.28	.08	No Predictors	——	——
Older	1. Zooms (-)	.37	.14	No Predictors	——	——
Incidental						
Younger	1. Vocalizations	.51	.26	1. Adult narration (-)	.39	.15
	2. Sound effects	.56	.31			
Older	1. Child Dialog	.38	.15	1. Child dialog	.31	.10
	2. Music	.46	.21			

Note: Criterion for entry of a predictor was: F significant at $p < .05$ or better.